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The formation of periodic diffractive plasmonic nanostructures with implanted copper nanoparticles by local ion etching of silica glass

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Abstract

Silica glass was subjected to a low-energy implantation with 40-keV Cu+ ions at a dose of 7.5 × 1016 ions/cm2 and an ion-beam current density of 5 μA/cm2 through a surface metal-wire mask with square holes of ~40 μm. The formation of copper nanoparticles in the glass was determined from the occurrence of characteristic plasmon optical absorption and through the detection of particles using an atomic force micro- scope. The formation of periodic surface microstructures via the local etching of silica glass during implantation was observed using a scanning electron microscope. The operating efficiency of the diffractive optical plasmonic element based on silica glass microstructures with metallic copper nanoparticles was shown during its sounding by the emission of a helium-neon laser. © 2013 Pleiades Publishing, Ltd.

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